SWRHL-50r

NIMBUS-B/SNAP-19 LAUNCH

MAY 18, 1968

OFF-SITE RADIOLOGICAL SURVEILLANCE

by
Environmental Surveillance
Southwestern Radiological Health Laboratory

Department of Health, Education, and Welfare
Public Health Service
National Center for Radiological Health

December 1968

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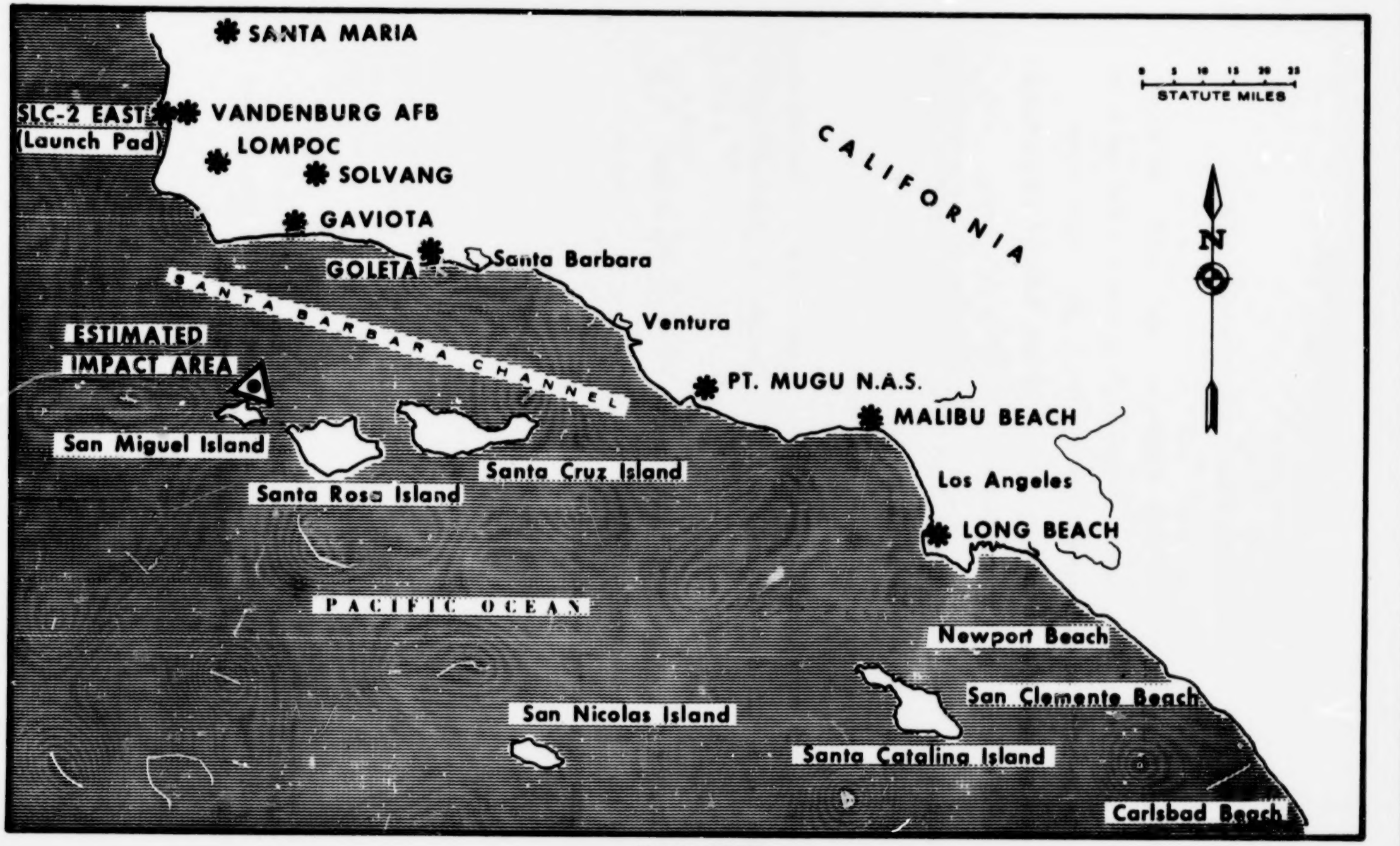
I. INTRODUCTION

The Southwestern Radiological Health Laboratory (SWRHL) of the National Center for Radiological Health (NCRH), Public Health Service (PHS) provided off-site monitoring for the launch of the Nimbus-B/SNAP-19. This report presents the results of that surveillance in partial satisfaction of general NCRH responsibilities for radiation surveillance and in specific response to Atomic Energy Commission Nevada Operations Office (AEC/NVOO) as requested by letter of April 23, 1968 from AEC/NVOO to the Director, SWRHL.

The vehicle was launched from location SLC-2 East (Figure 1), Vandenberg Air Force Base at 0121 hours PDT, May 18, 1968. Shortly after launching, the vehicle was destroyed because of an undesirable flight path. The best estimates placed the impact area of the generator package about 5 miles north of San Miguel Island in the Santa Barbara Channel (Figure 1).

Following the abort SWRHL monitors moved immediately into locations along the beach from Gaviota to Long Beach, including three islands off the coast. They began monitoring for possible contamination and to collect environmental samples for analysis.



MAY--1968

SNAP-19 SURVEILLANCE AREA

FIGURE 1

II. SAMPLE COLLECTION AND ANALYSIS

Samples collected included air, vegetation, soil, milk, and water (fresh and sea). Sampling locations for pre-launch activities were set up to coincide with previous work done in the area[1]. Post-launch sampling locations were chosen on the basis of meteorological and radar impact information.

Samples collected after the aborted launch were returned by SWRHL aircraft and analyzed immediately for gross alpha concentrations in order to provide guidance for further surveillance operations.

The samples were treated as described in the SWRHL, "Operations Plan for the Off-Site Surveillance for the Launch of SNAP-19," which is attached to this report.

During the pre-launch and immediate post-launch phase (May 16 to June 18, 1968) of the SNAP-19 launch surveillance, a total of 178 samples were collected and analyzed.

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[1]Radiation Surveillance in Santa Barbara County, California, July 1, 1963 - January 1, 1965; the EDP of SWRHL, Department HEW, PHS, Las Vegas, Nevada, March 15, 1965.

III. DESCRIPTION AND INTERPRETATION OF DATA

The data are presented in Tables 1-4 as follows:

Table 1 - Ground Monitoring

Table 2 - Vegetation, Soil, and Water

Table 3 - Air Sampling

Table 4 - Milk

The ground monitoring summary includes average instrument readings before the launch in the Lompoc area and after the launch along the main coast from Gaviota to 110 miles southeast of Gaviota, and on the Channel Islands. The alpha activity on the ground (cpm/55 cm^2) is listed under the PAC-IS column. The gamma activity (cpm), as measured with a Plutonium Gamma Probe, is listed under the PG-1 column and the gamma exposure rate (mR/hr) is listed in the E-500B column. These values are comparable to those reported in earlier studies[2]. All levels measured were as expected for natural radioactivity.

The gross alpha summary includes results on soil, water, and vegetation with results expressed as activity (pCi) per gram or liter. The error associated with each value is based on counting statistics (95% C.L.) and does not include those errors which may be associated with variation in sample moisture content and natural soil activity due to various types of soil. These data are about as expected for natural radioactivity[3].

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[2]Ibid

[3]Radiation Hygiene Handbook, Hanson Blatz, McGraw-Hill Book Co., Page 4-7.

The air sample gross alpha activity summary is presented in Table 3. In all cases, the alpha activity was less than 4 counts per minute total (12 day count, volume $\geq$ 600 ft^3), the minimum detectable activity. Beta and gamma analyses were done on all air filters. No evidence of radioactivity from this operation was found.

SWRHL operates an air surveillance network consisting of 110 air sampling stations in 20 states west of the Mississippi River. From May 18 to May 31, all filters from these stations were carefully examined for gross alpha activity. No evidence of an increase in gross alpha activity was found.

Three milk samples were collected and analyzed for gamma activity. These results are reported in Table 4 and show normal background levels.

IV. RECOVERY OPERATION

The generators were located on October 4, 1968. They were positively identified through underwater color photographs along with debris from the launch vehicle.

The recovery of the generators and debris was completed on the afternoon of October 9, 1968, by use of a two-man submarine and "hard hat" divers. The generators had no visible damage except for the loss of a small portion of the graphite coating on one of them.

The generators were placed in a steel drum containing fresh water. The drum was sealed and loaded on a truck for transshipment to Mound Laboratories.

V. SAMPLE COLLECTION AND ANALYSIS

During the recovery operations two fish samples were obtained for analysis. Salt water samples from the recovery box and fresh water samples from the steel drum were also obtained. Fresh water from the mainland was obtained to verify non-contamination during the entire operation (launch, abort, and recovery).

Gross alpha and specific plutonium-238 analyses were performed on the samples. Gross analysis was performed as described in the Operations Plan. Specific analysis included solvent extraction and electrodeposition. The electroplated samples were counted with a solid state alpha detector and a multi-channel analyzer.

The results from the recovery operations are presented in Table 5 and show no increase in background.

VI. SUMMARY

The SWRHL monitored the off-site area during and after the unsuccessful launch of the Nimbus-B/SNAP-19 satellite. A variety cf environmental samples was collected from the mainland, sea, and channel islands and was compared to previous data from the area. During the recovery operations, additional samples were taken. No increase in environmental radioactivity levels was observed from this operation.

Table 1. Ground monitoring summary

Location	Date	PAC-1S* α(cpm/55cm²)	PG-1 γ(cpm)	E-500B** (Open Probe) (mR/hr)
Pre-Launch				
Santa Maria	5-16-68	3	2100	----***
Surf	5-17-68	3	850	0.01
Miguelito Park	5-17-68	4	1000	----
Lompoc	5-17-68	4	3500	0.01
Paradise Store	5-17-68	3	2000	----
Vandenberg Village	5-18-68	4	2000	----
Post-Launch				
Gaviota Beach	5-18-68	3	----	----
Gaviota Beach Turn-off, Highway 1	5-18-68	5	----	----
10 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	1	----	----
20 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	3	----	----
30 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	2	----	----
40 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	2	----	----
50 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	0	----	----
60 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	3	----	----
70 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	2	----	----
80 mi SE Gaviota Beach Turnoff, Highway 1	5-18-68	4	----	----
90 mi SE Gaviota Beach Turnoff, Highway 1 (Zuma Beach)	5-18-68	2	----	----

Table 1. Ground monitoring summary (continued)

Location	Date	PAC-1S* α(cpm/55cm²)	PG-1 γ(cpm)	E-500B** (Open Probe) (mR/hr)
Post-Launch (continued)				
100 mi SE Gaviota Beach Turnoff, Highway 1 (Topanga)	5-18-68	2	----	----
110 mi SE Gaviota Beach Turnoff, Highway 1 (Malibu)	5-18-68	2	----	----
Santa Cruz Island	5-18-68	Instrument Failure	3500	----
Santa Rosa Island	5-18-68	0	1500	----
San Miguel Island	5-18-68	2	1000	0.015
Gaviota Beach	5-19-68	4	----	----

*The average of five readings within one square meter.

**The reading is with a Geiger-Mueller probe with the shield open. The closed shield probe was calibrated with ^{137}Cs. The unit mR/hr indicates a meter deflection and not exposure rate.

***Not taken

Table 2. Gross alpha summary.

Location	Date Collected May 1968	Soil* (pCi/g)	Water (pCi/l)		Vegetation (pCi/g)
			Fresh	Salt	
Lompoc	17	1.1 ± 1.0			< 0.2
Gaviota State Beach Park	18	1.1 ± 0.4			< 0.2
10 mi SE Gaviota Beach Turnoff, Highway 1	18	< 0.2 ± 0.5			0.7
20 mi SE Gaviota Beach Turnoff, Highway 1	18	1.1 ± 1.0			< 0.2
30 mi SE Gaviota Beach Turnoff, Highway 1	18	0.4 ± 0.6			0.7
40 mi SE Gaviota Beach Turnoff, Highway 1	18	1.1 ± 0.3			< 0.2
50 mi SE Gaviota Beach Turnoff, Highway 1	18	5.2 ± 2.4			0.2
60 mi SE Gaviota Beach Turnoff, Highway 1	18	3.8 ± 0.5			< 0.2
70 mi SE Gaviota Beach Turnoff, Highway 1	18	1.1 ± 1.1			0.5
80 mi SE Gaviota Beach Turnoff, Highway 1	18	0.4 ± 0.6			< 0.2
Port Hueneme	18	0.4 ± 0.5		3.6	< 0.2
90 mi SE Gaviota Beach Turnoff, Highway 1 (Zuma Beach)	18	0.9 ± 0.7			< 0.2
100 mi SE Gaviota Beach Turnoff, Highway 1 (Topanga Beach)	18	1.1 ± 0.9			0.2
110 mi SE Gaviota Beach Turnoff, Highway 1 (Malibu Beach)	18	1.1 ± 0.9			< 0.2
Santa Rosa Island	18	0.9 ± 0.7	< 1	< 1	< 0.2
Santa Cruz Island	18	0.7 ± 0.4	< 1		< 0.2
	18	2.9 ± 0.9			
San Miguel Island	18	Lost in analysis	< 1	< 1	< 0.2
Carlsbad Beach	19	2.0 ± 0.5		< 1	< 0.2

Table 2. Gross alpha summary. (continued)

Location	Date Collected May 1968	Soil* (pCi/g)	Water (pCi/l) Fresh	Water (pCi/l) Salt	Vegetation (pCi/g)
San Clemente Beach	19	2.0 ± 0.7		1.6	< 0.2
Newport Beach	19	0.9 ± 0.4			
	19	2.7 ± 1.6	< 1		< 0.2
Redondo Beach, Palos Verdes Pt.	19	1.1 ± 0.3		2.0	
Redondo Beach	19	1.1 ± 0.7	< 1		< 0.2
El Segundo Beach	19	0.4 ± 0.2	< 1		
Malibu Beach	19	0.9 ± 0.5		1.6	
Zuma Beach	19	0.4 ± 0.3	< 1		
Laguna Beach	20	0.4 ± 0.3		2.0	< 0.2
Gaviota State Beach	21	0.7 ± 0.8	< 1		
Goleta State Beach	21	0.4 ± 0.6	< 1		
Emma Wood Beach	21	0.9 ± 0.9	< 1		
San Miguel Island, Harris Pt.	21		< 1		
San Miguel Island, 1-1/4 mi inland W Harris Pt.	21	< 0.2 ± 0.3		1.4	
San Miguel Island, 1-1/2 mi inland W Simonton Cove	21	< 0.2 ± 0.3	< 1		
San Miguel Island, 1-1/4 mi SE Harris Pt. (Cuyler Harbor)	21	0.2 ± 0.2	< 1		
San Miguel Island 1-1/4 mi off Prime Rock, 320° Mag.	21		< 1		
CUSS I Drill Rig**	21		< 1		
Malibu Beach	22	0.9 ± 0.9	< 1		
Newport Beach	22	0.7 ± 0.8	< 1		
San Clemente Beach	22	0.4 ± 0.6	< 1		
San Miguel	23	0.4 ± 0.6	< 1	***	< 0.2
	23	2.0 ± 1.3			< 0.2
	23	< 0.2 ± 0.4			< 0.2
	23	< 0.2 ± 0.4			< 0.2
	23	< 0.2 ± 0.4			
	23	0.2 ± 0.4			
	23	0.2 ± 0.4			

Table 2. Gross alpha summary. (continued)

Location	Date Collected May 1968	Soil* (pCi/g)	Water (pCi/l)		Vegetation (pCi/g)
			Fresh	Salt	
Santa Rosa	24	0.4 ± 0.6			< 0.2
Goleta State Beach	24	1.1 ± 2.3		< 1	
Gaviota State Beach	24	1.3 ± 1.1		< 1	
Ventura Beach	24	4.0 ± 1.9		< 1	
San Clemente Beach	24	0.7 ± 0.8		< 1	
Malibu Beach	24	1.6 ± 1.2		< 1	
Newport Beach	24	0.9 ± 0.9		< 1	
Goleta State Beach	28	0.2 ± 0.4		< 1	
Gaviota State Beach	28	0.7 ± 0.8		< 1	
Malibu Beach	29	1.3 ± 1.1		< 1	
San Clemente Beach	29	2.7 ± 1.6		< 1	
Goleta State Beach	31	1.1 ± 2.3		< 1	
San Clemente Beach	31	2.7 ± 1.6		< 1	
Malibu Beach	31	2.3 ± 1.4		< 1	
Ventura Beach	31	1.3 ± 1.1		< 1	
Newport Beach	31	2.7 ± 1.6		< 1	
Gaviota Beach	31	2.3 ± 1.4		< 1	
Carlsbad State Beach	31	0.7 ± 0.8			
	June 1968				
Goleta State Beach	07	0.7 ± 0.8		< 1	
Carlsbad State Beach	07	1.1 ± 2.3		< 1	
Malibu Beach	07	0.7 ± 0.8		< 1	
Newport Beach	07	0.9 ± 0.9		< 1	
Ventura Beach	07	1.3 ± 1.1		< 1	
	07	2.5 ± 1.5		< 1	
Gaviota State Beach	07	2.0 ± 1.3		< 1	
Carlsbad State Beach	17	0.2 ± 0.4		< 1	

Table 2. Gross alpha summary. (continued)

Location	Date Collected June 1968	Soil* (pCi/g)	Water (pCi/l)		Vegetation (pCi/g)
			Fresh	Salt	
San Clemente Beach	17	0.7 ± 0.8		< 1	
Redondo Beach	17	0.7 ± 0.8		< 1	
Carpenteria Beach	18	0.2 ± 0.4		< 1	
Gaviota State Beach	18	1.1 ± 2.3		< 1	
Goleta State Beach	18	0.9 ± 0.9		< 1	

*95% C. L. based on counting statistics
**Impact area
***Combination of 5 samples collected

Table 3. Air sampling summary

Location	Time On		Time Off		Alpha Activity*
Paradise Camp	5-16	1712	5-17	1645	ND
	5-17	1730	5-18	0245	ND
Santa Maria	5-16	1710	5-17	1645	ND
	5-17	1700	5-18	0245	ND
Gaviota Beach Turnoff, Highway 1	5-18	0430	5-19	1150	ND
Lompoc	5-18	1215	5-19	1525	ND
Miguelito Park	5-16	1700	5-17	1700	ND
	5-17	1705	5-18	0105	ND
	5-18	0200	5-19	1245	ND
	5-19	1300	5-20	1030	ND
Point Mugu N. A. S.	5-18	0420	5-18	0530	ND
	5-18	0545	5-18	1210	ND
	5-20	1025	5-21	0915	ND
	5-21	1100	5-22	0800	ND
	5-22	0950	5-23	1015	ND

*ND - less than 4 cpm total alpha activity on 12 day counts, volumes $\geq$ 600 ft^3.

Table 4. Milk summary

Location	Date Collected	Activity (pCi/l)			
		$^{131}I^{*}$	^{137}Cs	^{89}Sr	^{90}Sr
Solvang	5-18-68	< 10	20	< 5	< 2
Lompoc	5-19-68	< 10	< 10	< 5	< 2
Santa Maria	5-18-68	< 10	< 10	< 5	< 2

Table 5. Recovery Operation Samples

Location	Type of Sample	Activity pCi/l or g
Recovery Box	Salt Water	< 0.1*
Shipping Barrel	Fresh Water	< 0.1*
Shipping Barrel	Fresh Water	< 1 **
Impact Area	Red Snapper Fish (Bone)	< 0.1*
Santa Barbara	Fresh Water	< 1
Lompoc	Fresh Water	2
Lompoc	Fresh Water	3

*Specific analysis (^{238}Pu) estimated minimum sensitivities 0.1 pCi/l or 0.1 pCi/g.

**Gross alpha analysis estimated minimum sensitivity 1 pCi/l.

OPERATIONS PLAN

FOR

OFF-SITE SURVEILLANCE FOR THE LAUNCH OF A SNAP-19

May 10, 1968

Prepared by

Southwestern Radiological Health Laboratory
U. S. Public Health Service
Department of Health, Education, and Welfare
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OPERATIONS PLAN
FOR
OFF-SITE SURVEILLANCE
FOR
THE LAUNCH OF A SNAP-19

I. INTRODUCTION

The Southwestern Radiological Health Laboratory (SWRHL) of the National Center for Radiological Health, U.S. Public Health Service will provide off-site monitoring for the launch of the SNAP-19 from Vandenberg AFB, California.

II. RESPONSIBILITIES

The SWRHL will provide the services listed below, with respect to the off-site area.[1]

1. Maintain a record of background environmental radioactivity levels during the launch activities to assure protection of the general population and environment.
2. Provide liaison regarding health protection between local and state officials and oificials of the 1st Strategic Air Division.
3. Provide community information to assure the public that their safety will be protected during the launch.
4. Identify specific hazards, if any, associated with the launch and assist in carrying out appropriate protective measures.

III. OPERATING PROCEDURES

A. Interagency Relations

The interagency relations program shall be the direct responsibility of the Public Health Service Project Officer. He will contact local, state, and military leaders throughout the off-site area to describe the surveillance activities. He or his representative will follow up all initial contacts to answer questions which may arise and provide continuity of information.

[1]That area outside the Vandenberg AFB. The area of immediate interest includes Santa Barbara County.

B. Personnel

Personnel will be assigned from the Southwestern Radiological Health Laboratory. This staff will receive special alpha monitoring training at the SWRHL as well as receive actual alpha monitoring experience at the Nevada Test Site (NTS). The staff will be in the field at D-3 days for orientation, communications check and background determination. The Director of SWRHL will be in charge of all PHS personnel and will be currently advised by the Project Officer. Assignments of personnel will be made prior to the start of the activities.

C. Communications

Two-way radio communication is planned through radios installed in vehicles. Standby points will be previously selected in order to maintain continuous communications. Radio communications are through a simplex system, but terrain precludes direct contact and an airborne voice relay is planned. Preliminary investigation will establish the locations for optimum communication.

Each standby unit will inform the field office of the number of a phone near the standby position. In the event of radio failure, commercial telephones will be utilized.

D. Field Plan

On launch day four mobile units will be on standby at strategic points throughout Santa Barbara County, two additional units will be on standby in the Vandenberg area for commitment as events dictate. It is anticipated that the units will be located at Santa Maria, Vandenberg Village, Gaviota, and Buellton.

Each mobile unit will be equipped with suitable monitoring instrumentation for the measurement of alpha radiation as well as the de-

tection of the low energy gamma radiation from specific types of alpha omitting nuclides; sample containers for the collection of water, vegetation and soil; portable air samplers for unattended air sample operation in remote areas; the necessary supplies and forms for proper documentation of PHS field activities. In case of accident each unit will establish an air sampler at a previously designated location and initiate action as directed by the Project Officer. Six air samplers will be operated continuously for 24 hours through the day of the launch. Sampling sites will be at Vandenberg Air Force Base, Lompoc, Surf, Jalama, Buellton, and Gaviota. These sites will be operated without regard to incidents.

In case of accident, the Public Health Service personnel will document any radioactivity which is released. They will also be available to provide assistance and consultation if an unforeseen emergency occurs. In addition, they will collect local environmental samples for laboratory documentation of the extent of contamination.

In case of accident, monitors will determine the extent of contamination using survey meters. More accurate assessment of the contamination will be obtained through laboratory analysis of samples collected from the field. This laboratory analysis will consist of the gross alpha procedures identified as Appendix A.

E. Reports

A consolidated summary of SWRHL activities giving actions taken, areas covered, and field results will be prepared at the conclusion of the launch operation. This report will be submitted to appropriate government agencies and State and local health departments.

APPENDIX A

Selected Sample Control and Analytical Procedures used at the Southwestern Radiological Health Laboratory.

APPENDIX A-1

Laboratory Procedures

Sample Control. One person will be responsible for receiving and logging samples as they are brought in from the field. Samples will be assigned a number by the person in charge of logging. The Off-Site data sheet will be used for air samples. Simple logging of location and time are all that is initially required.

APPENDIX A-2

A Rapid Method for the Determination of Gross Alpha in Sea Water and Natural Water Samples

Introduction

This method describes a rapid procedure for the determination of soluble and suspended alpha activity in sea water. This method is also applicable to other natural water samples. The recovery, using a plutonium nitrate spike, averaged 80%.

Sample

Results by this method are entirely dependent upon the sample. A representative sample must be secured, and the analysis made as soon as possible.

Apparatus and Reagents

Beaker, graduated, 1,000 ml

Counter, laboratory, any suitable alpha counter

Planchet, stainless steel, 2 inch with 5/16 rim

Tube, immersion, 60 M (Corning Catalog #39535 or equivalent)

pH Paper

Ammonium Hydroxide, Concentrated

Cerric Nitrate, 0.5 M

Ferric Chloride, 1 M

Nitric Acid, concentrated, 3N

Procedure

1. A 1,000 ml sample of water is measured in a graduated beaker.
2. Add, with stirring, 20 ml concentrated HNO_3, 0.5 ml of 0.5 M Cerric nitrate, and 2 drops of 1 M ferric chloride - in that order.
   NOTE: A blank determination should be run on the Cerric nitrate.

3. Adjust to a pH of 9, with pH paper, using concentrated NH_4OH, stir and add 2-3 drops excess.
4. Let precipitate form. Filter, using an immersion tube. discard the supernate.
5. Dissolve the precipitate by carefully washing the walls of the beaker and face of the immersion tube with a minimum of 3 N HNO_3.
6. Transfer quantitatively to a tared planchet using 3 N HNO_3, evaporate, flame and weigh. Submit for alpha counting.

APPENDIX A-3

A Rapid Method for the "Estimation" of Deposited Alpha Activity on Soil, Vegetation and Similar Sample Types

Introduction

This method describes a procedure for the "estimation" of alpha activity in soil and vegetation samples. Leafy flora samples will be done by Method 3, Appendix B-4.

The sample is leached in a beaker with nitric acid and the sample is filtered. Evaporation of a suitable portion of the filtrate is followed by counting. A portion of the solids is tested for any remaining alpha activity. When the method was run as specified, a yield recovery of 80% average was obtained for soluble plutonium nitrate spikes.

Apparatus and Reagents

Beaker, 1,000 ml

Counter, laboratory, any suitable low level alpha counter

Filter paper, #2

Filter flask, 1,000 m

Buchner funnel, 3"

Flask volumetric, 1,000 ml

Hot plate, electric

Planchet, stainless steel, 2" diameter

Stirring rods, mechanical or manual

Nitric acid, 3 N

Procedure

1. Transfer the entire weighed sample (200 g or less) to a 1 liter beaker. Add 400 ml 3 N HNO_3 and place on hot plate.
2. Bring and keep solution near boiling for 30 minutes with stirring.

3. Cool and filter through a Buchner funnel with #2 filter paper under vacuum. Save filtrate.
4. Repeat leach a second time combining filtrates. Dilute filtrates to 1,000 ml.
5. Take a suitable aliquot (Note #1) of filtrate to give a residue upon evaporating in planchet of not more than 100 mg.
6. Evaporate aliquot to dryness, flame, weigh, and submit for alpha counting.

NOTES:

1. The "suitable aliquot" in step #5 can be determined by running evaluation samples from the area of sampling.
2. The leached soil or vegetation should be dried and several 80-100 mg portions counted on a planchet in a proportional counter to estimate any large amount of insoluble alpha activity.
3. The occurrence of natural α activity in soil, and unreproducible sampling conditions introduce errors of unacceptable magnitude when soil reporting results are in units of activity per unit area.

APPENDIX A-4

A Rapid Method for the Estimation of Deposited Alpha Activity on Flora

Introduction

This method describes a washing procedure to remove deposited activity on flora. A sample of 50-100 g is placed in a 400 ml beaker and washed with 1 N HNO_3 in an ultrasonic cleaner. Evaporation of the wash water depending upon solids present, is followed by counting. A 90% average recovery is obtained for this procedure.

Apparatus and Reagents

Ultrasonic cleaner - tank unit, Harrison Model 751 or equivalent.

Beaker, 400 ml

Counter, laboratory

Nitric Acid, 1 N

Planchet, stainless steel, 2" diameter

Procedure

1. Weigh a suitable sample (50-100 g) and transfer to a 400 ml beaker.
2. Add 200 ml 1 N NHO_3 and place in a suitable ultrasonic cleaner tank. Operate unit for 10 minutes.
3. Carefully remove flora, washing with 1 N HNO_3. Evaporate wash solution to near dryness and transfer to a planchet, evaporate to dryness, flame and weigh. Submit for alpha counting.

NOTES:

If the wash solution contains a large amount of solids, an aliquot should be taken for counting. Maximum residue on the planchet should not exceed 100 mg.

APPENDIX A-5

Radioassay Procedures

Gross alpha determination will be made using a Beckman Wide-Beta proportional counter. Calculations to be used with the counter are as follows:

$$\text{pCi (alpha activity)/gm} = \frac{\text{cpm}}{\text{E x 2.22 x wt. of sample (gm)}}$$

WHERE: E = Determined from following table

Sample Thickness (mg/cm^2)	0	2.5	5
E	27	21	16

$$\text{pCi (alpha activity)/ft}^2 = \text{pCi/gm} \times \frac{\text{wt. of sample (gm)}}{\text{A}}$$

WHERE: pCi/gm = from above

A = Area sampled ($\frac{64}{144}$ ft^2)

APPENDIX B

General Field Procedures

APPENDIX B-1

Monitoring and Record Keeping

Field units will compile a comprehensive record of all their activities. The record will consist of the date, the location, the times of action, the times of receipt of radio or telephone messages, the point of contact in terms of telephone number and location. They will also maintain a record of general readings obtained with the low energy gamma probe (PG-1) on the PAC 1-S instrument for background purposes prior to and during the launch. These values will be recorded by place, time and level with instrument number identification. This field log will contain specific data on samples taken and also summarize conversations held between PHS personnel and local individuals.

The PAC 1-S is a sensitive alpha survey instrument capable of giving reliable readings when used with caution. Since this is a scintillation counter, it is susceptible to light leaks. Before being taken to the field, all instruments will have been checked for light leakage. To avoid puncturing the light seal by stones, sticks or sharp edges of surface material, survey personnel will handle the instruments with extreme caution. Since it is an alpha measuring instrument, the head must be placed in close proximity to the source of material because of the limited range of alpha particles in air. It should be carefully laid on a flat surface, that has no protrusions which may puncture the light seal, and allowed to come to equilibrium. For those activities which are below the sensitivity of the integrating circuitry, a count can be obtained by use of a stop watch and the headset. Audible pulses can be then totaled for a known interval and the number of counts per minute determined.

This technique of monitoring does not lend itself to rapidly closing upon a contamination source. Therefore, for initial detection, a low energy gamma detector is provided which can be used to approach the source. However,

the sensitivity of the gamma probe is much less than that of the flat area alpha probe and for the delineation of action areas the flat area probe will be used.

All instruments should be periodically checked against the source provided with the monitoring kit.

APPENDIX B -2

Field Unit Check List

Eberline Emergency Monitoring Kit (PAC 1-S with Alpha scintillator probe and low-energy gamma probe)

2 Portable air samplers w/propane tanks

Glass fiber and membrane filters

Clippers and knife for vegetation sampling

Plastic bags for packaging soil and vegetation samples

Gallon bottles and cardboard boxes for water samples

Data sheets for air samplers

Monitoring log sheets

Glassine envelopes for packaging air sampler filters

Felt tip marking pens and grease pencils

Shovel and miscellaneous small tools

Field log book

APPENDIX B-3

Instrument Instructions

The PAC 1-S instrument, as delivered, has the alpha probe connected and calibrated. The tape on the side of the alpha probe lists the meter reading which should be obtained when the alpha check source is centered in the protective cover and the probe is resting on the source. The count rate recorded on the probe may differ from that listed on the source. In that event, use the value on the probe.

There are two sources provided with each kit.

1. Radium source, approximately 5 microcuries, for use with E-500B.
2. Uranium source for alpha probe and low energy gamma probe (PG-1).

The backside has a count rate and serial number. The plateside or front side appears as uncovered metal, be careful not to touch with anything.

To check for light leaks, place on X-1 scale, turn the face to the sun (or other strong light source) and tip in various positions watching indication. Cable noise will cause minor needle movement while rotating the probe. The needle will remain high while the probe is held steady if a light leak is present. If a major meter indication is observed, hold the probe against the body to cut out all light. If the reading drops, the needle deflection was caused by a light leak. When a light leak is observed in direct light, turn the probe away from the light source to determine if leaks are minor and if the instrument is usable. A minor leak would be reflected under 500 counts per minute. With a major leak, hold the probe facing direct light and cover with cardboard or other shield. Gradually open up the area to light by sliding the shield across the probe to locate the grid area involved. Recover and slide off at 90^{o} to original direction to isolate the portion of the grid area involved.

Paint this area with black lacquer provided with the kit. In using the lacquer, wipe the major portion off the brush and apply a thin coat to a small area.

After repair, repeat the pertinent instructions to determine the effectiveness of the procedure.

Changing to PG-1 (low energy gamma probe)

1. Turn instrument off.
2. Remove alpha probe at probe end of cable.
3. Connect PG-1 probe to cable.
4. Instrument may peg on X-1 scale so turn to X-10 scale.
5. Remove case with Ra source to a point at least 15 feet away.
6. Remove cap from discriminator.
7. Using small Eberline key chain screwdriver found in each kit, turn discriminator in clockwise direction to the stop, then back off (counter clockwise) 30° (2/3 of one division).
8. Check response by placing alpha check source on flat surface with metal up, cover with top of plastic petri dish (the top has the larger diameter), rest the end of PG-1 probe on top of petri dish cover. Instrument should read value written on tape stuck to side of PG-1 probe. This is an operational check and not a calibration.
9. Replace discriminator cap.

Use of PG-1 Probe

This probe is not and cannot be calibrated to give quantitative information on contamination. It is only an indicator or a search tool. Suspected contamination can be approached holding the cable and allowing the probe to hang about one foot from the ground. Indications of activity should be reassessed with the alpha probe.

Failure of the PG-1 to detect activity is not absolute proof that contamination is not present. However, it does prc ·de information that action levels have not been exceeded. Further evaluation of possible contamination must be conducted by use of the alpha probe.

Replacing Alpha Probe

1. Turn instrument off.
2. Remove PG-1 from probe end of cable.

3. Connect alpha probe to cable.
4. Turn instrument on to X-10 scale.
5. Remove discriminator cap.
6. Place alpha source with metal up inside circle in protective cover.
7. Place probe over source in protective cover.
8. With small screwdriver, slowly turn discriminator counter clockwise until meter movement is first observed. Continue turning counter clockwise in small increments allowing meter movement to stablize after each increment until meter indicates the counts per minute rate for source as marked on side of alpha probe. Use the value placed on the probe rather than the count rate given on the source. There may be a difference between the two values. Check to see that the source serial number matches the serial number recorded with the count rate on the side of the probe.
9. Replace the discriminator cap.

Use of Alpha Probe

1. The range of ^{238}Pu alpha is less than 4 cm in air, therefore, the alpha probe must be close to the surface being evaluated.
2. The instrument is of the scintillation type and the light seal (window area) which will admit alpha particles and exclude light is easily torn or punctured.
3. Only qualitative information can be obtained from non-uniform surfaces.
4. Quantitative information must be obtained from flat surfaces which extend beyond the probe on all sides. The probe must rest on or be adjacent to the flat surface for quantitative reading.
5. For most accurate quantitation the meter should remain horizontal.
6. After placing the probe, allow the needle to stabilize. The time necessary for stabilization is greater on the lower scales.
7. Recorded values should be the average of 5 readings taken one at each corner and one in the center of a square meter area.
8. Each of the 5 readings used to develop the above average value should be the mean between upper and lower meter fluctuations observed for each probe position.

APPENDIX B-4

Sample Identification and Marking

It is imperative that all samples collected in the field be suitably marked for subsequent identification. The sample information necessary is:

1. The description of the location sufficiently detailed for a second person to return to that area and take a duplicate sample.
2. The time and date of collection.
3. The type of sample.
4. The person collecting the sample.
5. Any additional remarks regarding condition of the soil, the sample, or the weather which may be pertinent to analysis or interpretation.

This information should be recorded in the monitoring log and also on a sample identification sheet which will accompany the sample.